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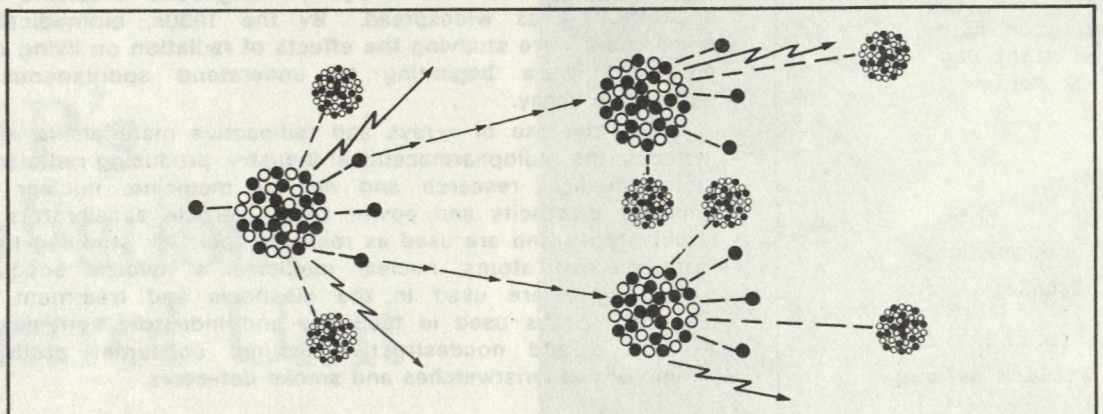

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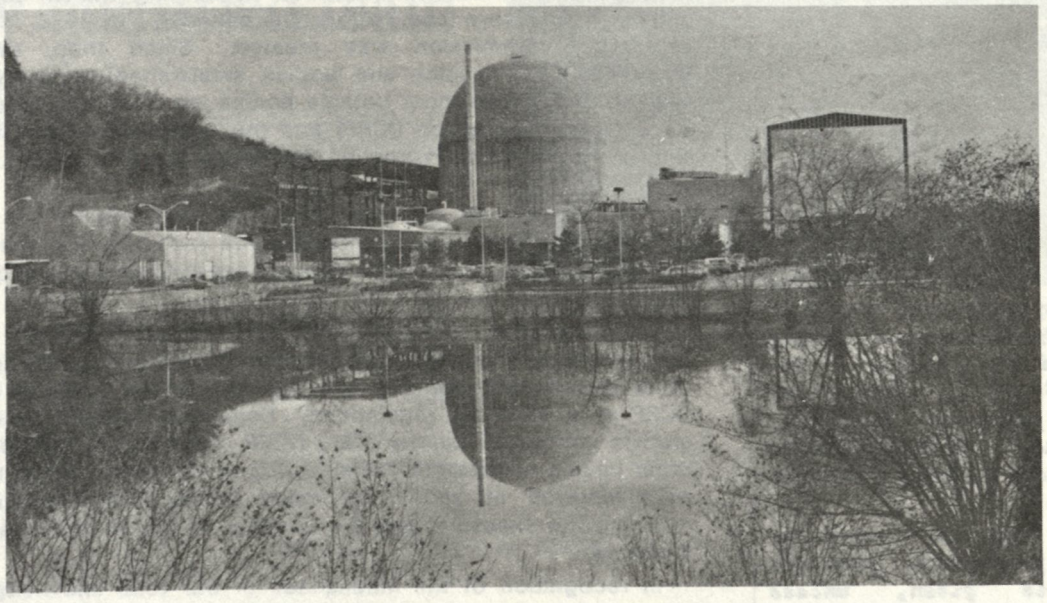

The Radiation Control Unit

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Cover: Diagram of radioactive decay; Equation for production of nuclear energy; Connecticut Yankee Power Plant: Photo: Robert Paier

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The Wider View

Radiation: a growing awareness

By Kevin McCarthy, Director, Radiation Control Unit

People have always been exposed to ionizing radiation from cosmic rays and naturally-occurring radionuclides in the earth. Awareness of radiation and radioactivity, however, dates back only to the late 1800s. By the 1920s, the use of x-rays in diagnostic medicine and industrial applications was widespread. By the 1930s, biomedical and genetic researchers were studying the effects of radiation on living organisms, and physicists were beginning to understand spontaneous fission and radioactive decay.

Today the use of x-rays and radioactive materials is widespread and includes: the radiopharmaceutical industry, producing radioisotopes needed for biomedical research and nuclear medicine; nuclear reactors that generate electricity and power ships; particle accelerators that produce radioisotopes and are used as research tools for studying the structure of materials and atoms; nuclear medicine, a medical specialty in which radioisotopes are used in the diagnosis and treatment of numerous diseases; x-rays used in medicine and industrial activities, such as oil exploration and nondestructive testing; consumer products, such as luminous-dial wristwatches and smoke detectors.

Initially, the dangers and risks in the use of x-rays and radioactivity were little understood. At the turn of the century, x-ray burns were being reported in the medical literature and by 1910 it was understood that such burns could also be caused by radioactive materials. By the 1920s, sufficient direct and indirect evidence had been accumulated to persuade the scientific community that an official body should be established to study and make recommendations concerning human protection against exposure to x-rays and radioactive material. In 1928, the first radiation protection commission was created. Since then, there have been numerous commissions and bodies established to study the effects of radiation. The two most notable bodies are: the International Commission on Radiation Protection (ICRP) and the congressionally-chartered National Council on Radiation Protection and Measurements (NCRP).

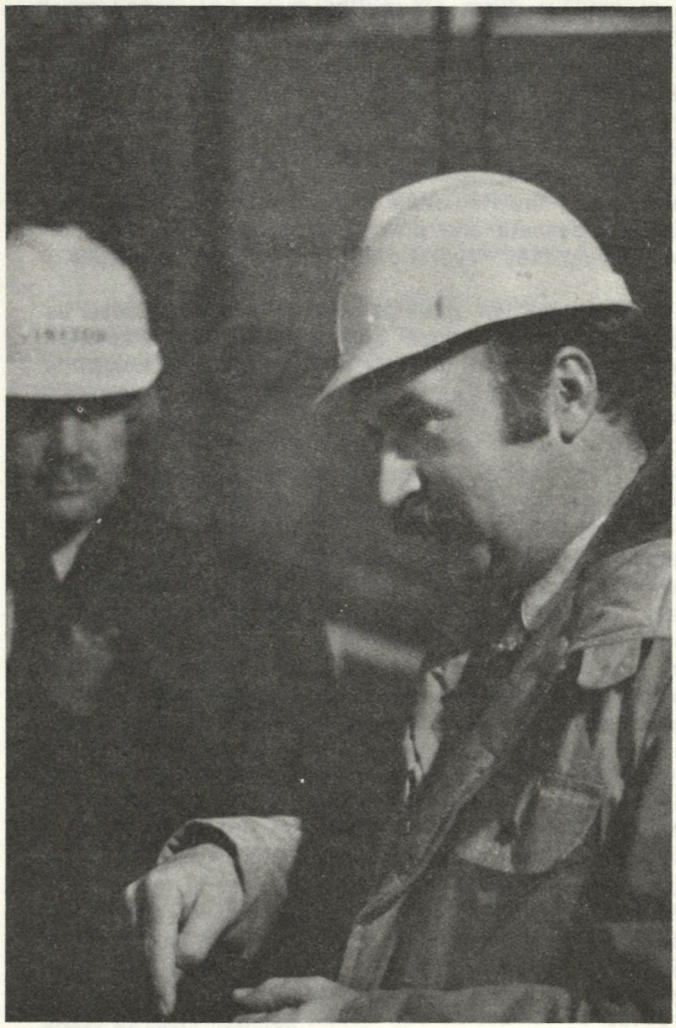
Throughout their existence, the ICRP and NCRP have worked closely together to develop radiation protection recommendations that reflect the current understanding of the dangers associated with exposure to ionizing radiation.

The Radiation Control Unit of the Connecticut Department of Environmental Protection, the Nuclear Regulatory Commission, OSHA, and other government agencies use the reports and findings of the ICRP and NCRP as a basis for regulations. Regulatory agencies use the extensive studies conducted by the ICRP, NCRP, the Federal Radiation Council, and other bodies to establish radiation exposure limits. These limits reflect the risks incurred at various exposure levels, the technical feasibility of reducing the exposure, and the benefits of the activity responsible for the exposure.

In recognition of the inadequacy of our total knowledge regarding the effects of radiation and the fact that any exposure might have some potential for harm, the federal and state regulatory agencies support an admonition that every effort should be made to reduce exposure to ionizing radiation to the lowest possible level. The DEP Radiation Control Unit continues to support this concept, known as ALARA (As Low As Reasonably Achievable). The ALARA concept has become the cornerstone of radiation protection philosophy. ■

DEP's Radiation Control Unit

A small, highly-qualified team on the job



Kevin McCarthy, Director of the RCU, at the site of Millstone III. Dan Rowland, of the FDA, looks on.

Text and Photos by Robert Paier

The Department of Environmental Protection's Radiation Control Unit is a small group of highly-trained professionals entrusted with a job which requires the utmost of precision, expertise, and understanding of modern technology and nuclear physics.

Stated briefly, the goal of DEP's Radiation Control Unit is to insure the safety of Connecticut residents in regard to ionizing radiation. This is accomplished by making every effort to reduce exposure to such radiation, both for those who work directly with radioactive materials and for the general public.

On a wider level, the Unit also works to insure that there is no buildup in the level of radioactivity in the environment beyond that which naturally occurs.

Director Kevin McCarthy is a nuclear physicist whose specialized training in radiation control includes study at the following institutions: the National Center for Radiological Health, Maryland; the University of Lowell, Massachusetts; the University of Connecticut; and extensive training in conjunction with the NRC and the EPA at Auburn, Massachusetts, the Nevada test site at Mercury, Nevada, and Oak Ridge, Tennessee. Among his other responsibilities, McCarthy is on call 24 hours a day in the event of an emergency situation at any of Connecticut's nuclear power plants; he is cleared for access to all areas of the plants; and he maintains offices in the "bunkers" of both plants should his authority and expertise be required. Other members of the staff of the Radiation Control Unit are involved in similarly delicate and potentially dangerous work, and the training they have undergone is similarly rigorous.

In this article, an attempt will be made to describe some of the functions and tasks of the Radiation Control Unit, and to indicate how its area of concern is vitally important to us all.

What is Ionizing Radiation?

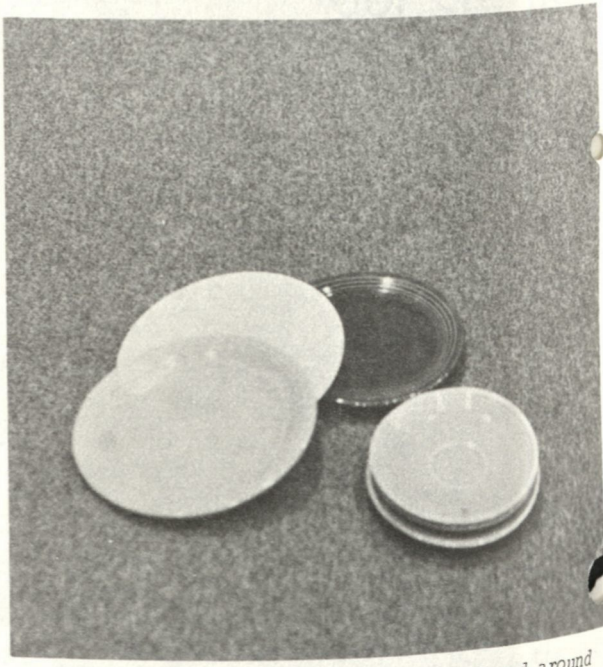
The problem that most of us have when approaching the subjects of radiation and nuclear power is that we are intimidated by the complexity we see. This article will present a very brief indication of what ionizing radiation is, where it comes from, what are its risks and its benefits, along with an encouragement to the reader to find out more. Like it or not, we now live in the nuclear age.

Ionizing radiation occurs when the nucleus of the atom is in an unstable condition and releases its excess energy in the form of radiation. Eventually, the atom returns to a stable condition. The radiation which results from radioactive decay is called "ionizing" because when it comes in contact with living tissue (contact with non-living tissues presents no problems here) it can "strip off" electrons from already-existing molecules and produce ions. The process of ionization can result in the transformation from one physical state to another physical state. When living tissue is ionized, the result to the organism can be sickness, cancer, death, and even genetic damage which can bring about defects in unborn generations.

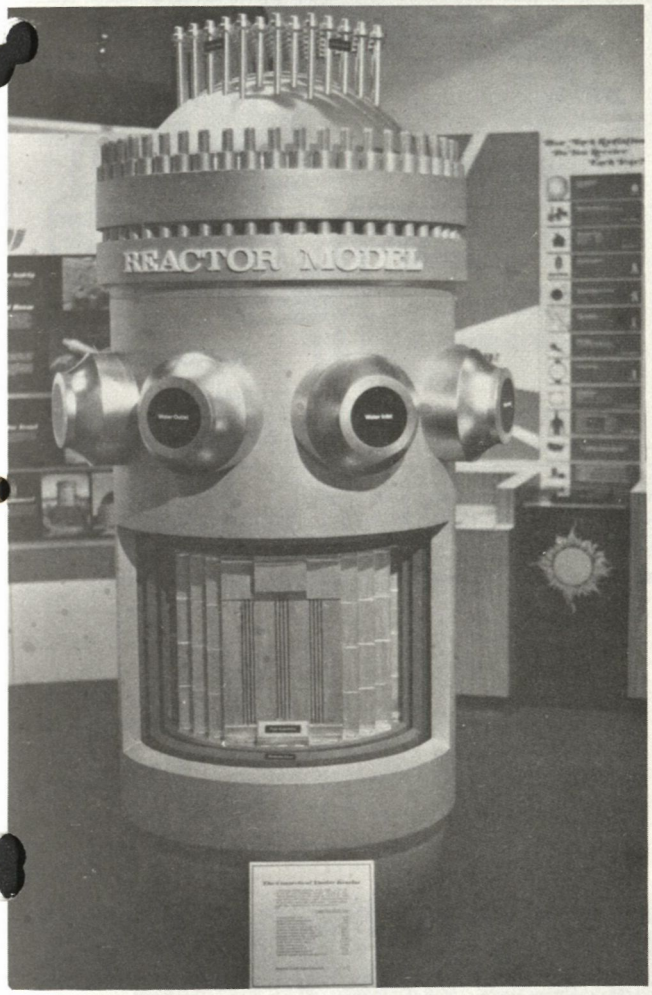
Those are the risks of ionizing radiation. The possible benefits involved are also significant. Ionizing radiation is used very frequently in industry and research, and in the field of medicine to the point where medical science today may be said to be characterized by the use of radiation. Medical radiation is used therapeutically in the treatment of localized tumors, and extensively as a diagnostic instrument.

"The risk-benefit equation associated with medical exposure, such as x-rays and nuclear medicine

The goal is to reduce exposure to radiation, both for those who work directly with radioactive materials, and for the general public.



"Fiesta-ware," a radioactive item found around the house.



A model of the reactor core at Connecticut Yankee Nuclear Power Plant.

When living tissue is exposed to ionizing radiation, the result to the organism can be sickness, cancer, death, or genetic damage.

examination, is all important," says McCarthy. "Every time ionizing radiation occurs, there is a degree of risk. It is up to every one of us to understand that risk, to evaluate the potential benefit to be derived, and to make our own decisions."

Naturally-occuring Background Radiation

It is not generally known that we are all constantly being bombarded with ionizing radiation, both from outer space and from within the earth. There is a measurable degree of radioactivity at many places on the planet and in our state. In fact, we are all slightly radioactive. Connecticut's foundation of granite, for example, is slightly radioactive, and so therefore are many of the state buildings which are built from that material. We receive a measurable dose of radioactivity when we fly from New York to Los Angeles, and the city of Denver receives roughly eight times as much radiation as the city of Hartford.

A responsibility of the Radiation Control Unit is to regularly monitor existing levels of radiation in Connecticut's environment through the source-related analysis of air, water, vegetation, milk, fish, shellfish, and sediment. This surveillance program is carried on under the supervision of Joseph Smollen, a radiation control physicist. With the knowledge of the normal background radiation at any given point, abnormally high levels are readily noted. This surveillance is done primarily in the areas surrounding fixed nuclear facilities.

ALARA

A recurring theme around any installation in which radioactive material is used is "ALARA," which stands for "As Low As Reasonably Achievable." This phrase characterizes the goal of the Unit. While the monitoring of x-ray equipment throughout the state involves a significant fraction of the man-hours put in, the Radiation Control Unit is also involved in the monitoring of transportation of radioactive materials from point to point in the state. Hospital equipment, such as uniforms, syringes, and petrie dishes, which may be contaminated, requires special cleaning, storage, and disposal, and this is another of the Unit's areas of responsibility.

"There are a number of exempt quantities," says McCarthy, holding up his wristwatch. "The faces of many wristwatches today are radioactive." It was surprising to learn from McCarthy that such benign-appearing items as the mantle from a Coleman lamp are radioactive, as well as a kind of ceramic glaze used in "fiesta ware," which contains small amounts of uranium.

The point, according to McCarthy, is that some degree of ionizing radiation is unavoidable, and will never be entirely eliminated from our lives.

Responding To Emergencies

While the day-to-day operation of the staff of the Radiation Control Unit is regulatory in nature, there are

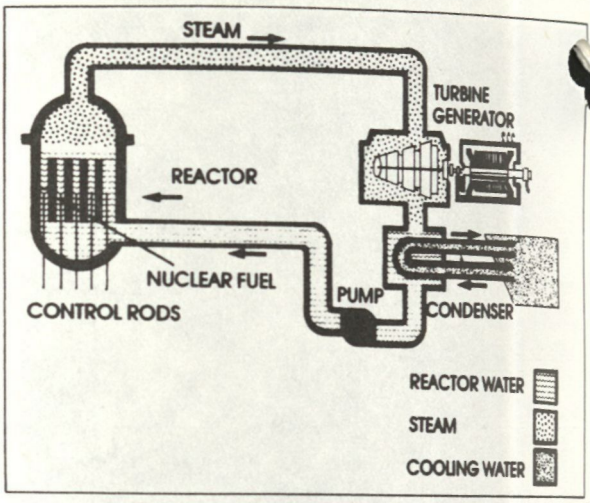
occasions when an emergency situation arises, and the training and expertise of the members of the Unit, their ability to respond quickly and correctly, become critical. McCarthy and his staff carry beepers, and are able to respond to different levels of emergency. This might involve coded signals to report to an installation within an hour to be of some help in evaluating a moderately urgent problem, to an all-out nuclear incident involving a power plant. A recent situation occurred in December, 1984, at Bradley Airfield which involved breakage and possible leak of radioactive material which was crushed when hoisted on a fork-lift. McCarthy was immediately called to the spot. He was able to evaluate the amount of radiation, physically contained the material, and insured that the contamination which resulted was under control. Finally, after McCarthy was able to determine that no hazard remained, normal operations were resumed at the airfield.

Nuclear Energy: The Power Plants

In trying to reach an understanding of nuclear energy and how it differs from any other form of energy yet unleashed by man, it is necessary to make a leap in our thinking. The energy involved in binding the nucleus is of a fantastic order; the numbers involved here are awesome. To get just a hint of the powers lying within the nucleus, we might consider that while the nucleus is by far the heaviest entity within the atom, it is extremely small relative to the atom's total volume. If it were possible (and in outer space it is at least theoretically possible) to have an object with a volume of one cubic centimeter which consisted only of nuclear matter, its weight would be 180 million tons. That is what we are dealing with when we approach the nucleus. The energy involved is of a magnitude far beyond our ordinary ways of thinking. There is great benefit to be derived from the successful use of this energy. There is great risk in the unsuccessful use.

There are three power plants currently operating in Connecticut: the Connecticut Yankee, at Haddam Neck, and Millstone I and Millstone II, in Waterford. Under construction is Millstone III, also in Waterford. The function of the plants is simply to use the energy from the controlled fissioning of radioactive material to create heat, to boil water, to create steam, to turn a turbine. The end result is electrical energy. The use of nuclear energy to produce electricity can be more clean and efficient than the use of coal or oil. A relatively small amount of nuclear fuel can produce a great deal of electricity with little pollution of the air and water. That is the benefit.

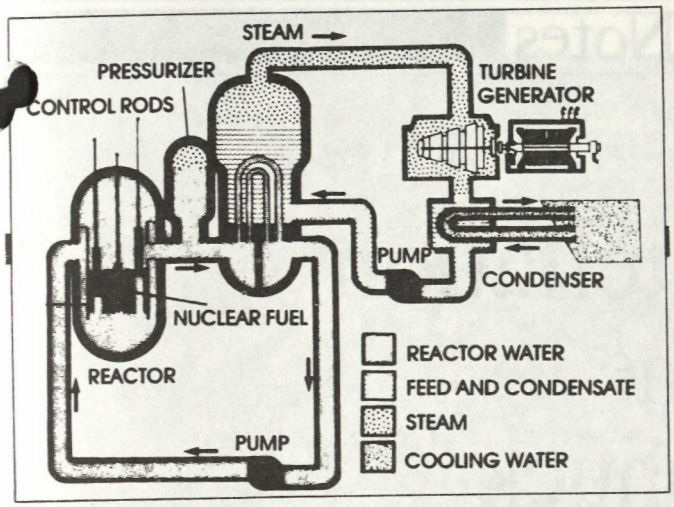
The risks here are two: the first is the possibility, however remote, of a "loss of coolant accident," the most feared event in a nuclear plant, which results in "melt-down" and the uncontrolled production of lethal levels of radiation; the second is the problem of nuclear waste. Because of the fact that radioactive decay continues over extremely long periods of time -- thousands and even millions of years -- it is necessary to insure that this waste be kept secure and



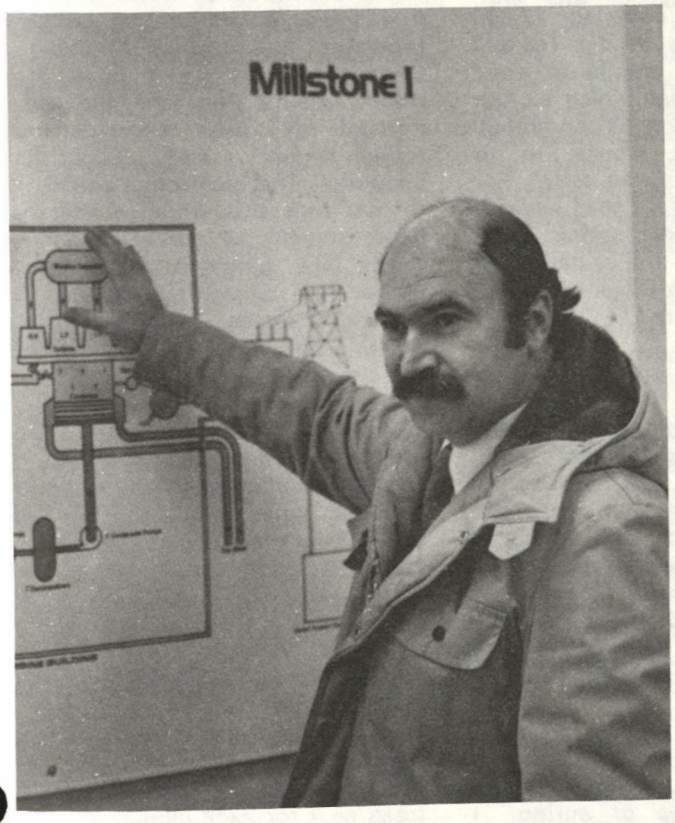
Boiling Water Reactor (BWR): In a BWR, the heat from nuclear fission causes water flowing through the reactor to boil, turning it to steam which flows directly to the turbine.

"It is up to every one of us to understand the risks, evaluate the benefits, and make our own decisions."

Kevin McCarthy



Pressurized Water Reactor (PWR): In a PWR, the water flowing through the reactor is heated,but is kept under pressure to keep it from boiling.



Kevin McCarthy explains the operation of the reactor at Millstone I.

safe for that length of time. So far, no one has come up with an absolutely safe solution to this problem.

In addition to being available should any emergency situation arise, the Radiation Control Unit closely monitors the areas surrounding the plants for changes in radiation levels. To date, the radiation levels around all three operating power plants have been the same or lower than in other parts of the state.

The Agreement State Program

The question of Connecticut's status as an "agreement" or "non-agreement" state is one which concerns Radiation Unit Director Kevin McCarthy.

The Nuclear Regulatory Commission (NRC) is the federal body responsible for overseeing and enforcing government guidelines in regard to nuclear energy, to include definition of hazardous exposure levels, the handling of high- and low-level waste, and transportation of radioactive materials. In 26 of the 50 states, however, the NRC has delegated most of that responsibility to the states themselves, under what is called "the agreement program." The advantage to the states entering into this agreement is that their control is more direct, immediate, and possibly more appropriate to each individual situation. The degree of control in regard to nuclear energy and radiation is thought to be more efficient if the controlling agency is within the individual state.

Connecticut is one of the 24 states which has not yet applied for agreement status. A great deal of preparation is required in order to apply for agreement status, in that the applying state must demonstrate its ability in terms of increased resources and manpower. "Our goal is to become an agreement state," says McCarthy. "In that way we can provide more timely and appropriate responses to the special needs of the state of Connecticut."

Individual Responsibility

The citizens of the state of Connecticut are fortunate in that a group of people of the high caliber and training of the Radiation Control Unit are on the job. The issues involved in understanding radiation and taking the proper steps to minimize its adverse effects are complex, and singularly qualified people are necessary.

On the other hand, because of the nature of radiation, with the possibilities both for tremendous benefits as well as for great danger, there are no absolute, final answers. Solutions are always in terms of trade-offs, a balancing of the "risk-benefit" equation. And, once again, the ultimate responsibility falls back on the individual citizen. It is our responsibility to decide just how much we are willing to risk in order to derive benefits we feel are necessary to our health and well-being. What we do here, how we understand and respond to this situation, will have wide-ranging, effects, both for ourselves, and for those who come after us. And, as always has been the case, the responsibility is ours. ■

The Constellation of the Woodchuck

By Penni Sharp

"The sun now passes from the constellation of the sled into that of the woodchuck."

H. D. Thoreau

Spring is a favorite season of many, although March, the month in which it begins, can sometimes be difficult to appreciate. Snow often remains, not in the pure blanket of white enjoyed in January, but more likely in dingy patches covered with dirt and soot. Trees are still bare, and many animals remain relatively inactive. Nonetheless, there is promise of better things to come. The days are perceptibly longer. The stronger sun riding high in the sky brings warmth and thaws the ground. Skunk cabbage blooms and tree buds swell. Toward the end of March, gardens can be tilled and early crops planted.

Spring has inspired poets, writers, and musicians, and when it finally arrives is perhaps the most welcome season of them all. One writer-naturalist, Edwin Way Teale, chose a unique way to observe the season of spring. He and his wife set off in mid-February for Florida where they began a four-month odyssey travelling along with the spring as it moved northward at its steady pace. The account of this journey is the subject of his North with the Spring, a book which makes excellent reading, particularly for those weary of winter.

Few of us will ever have the luxury of being able to travel from February to June, covering 17,000 miles and 23 states as did Teale. I have always felt a twinge of envy when reading his book which I often take up when spring is imminent. How interesting it would be to partake of this season so fully. For now, like many others, I shall have to be content to sample spring as it comes through the part of Connecticut in which I live. And just that has many rewards.

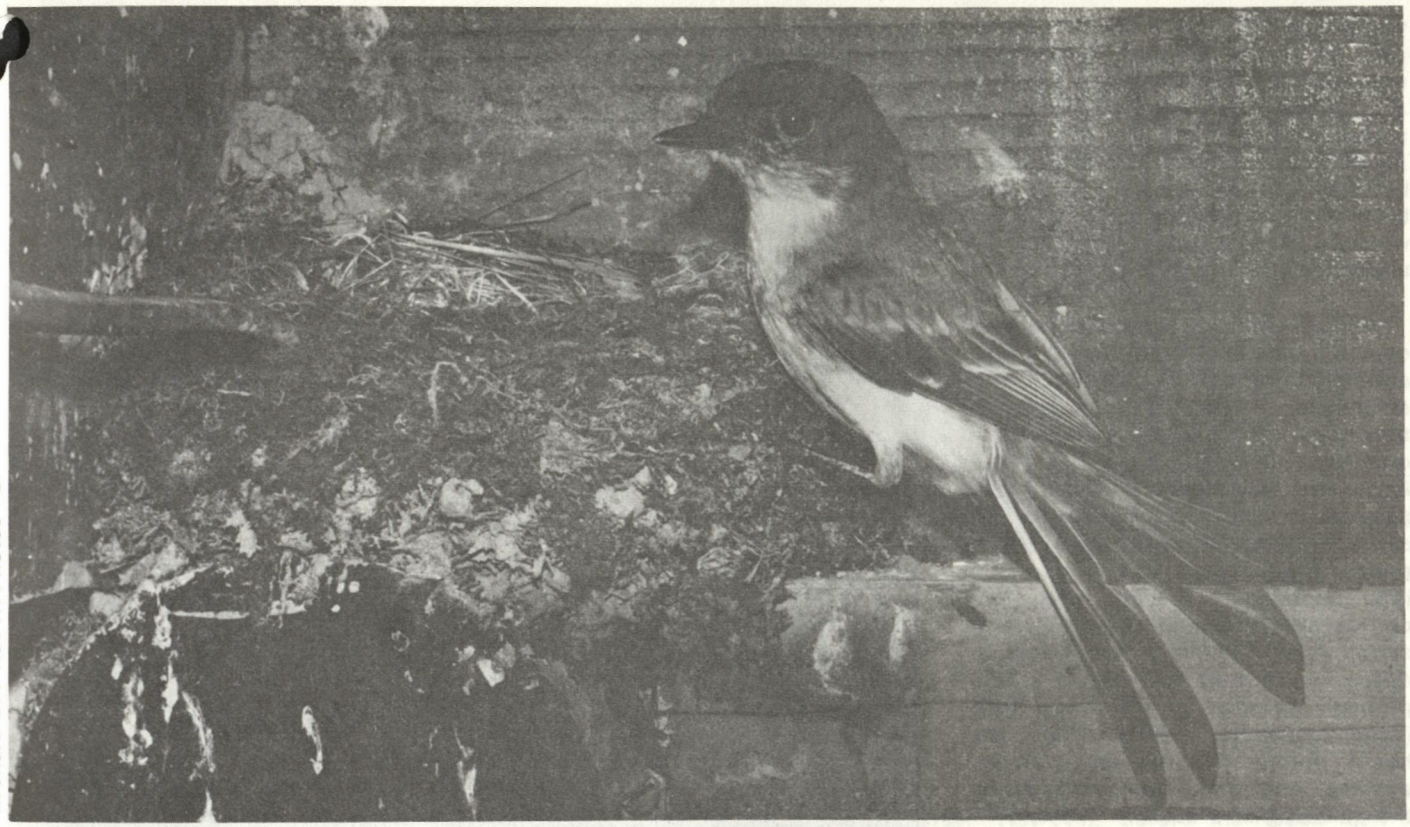
While it might provide only a narrow view of the many facets of the season, the vantage point from the backyard is a good place from which to observe the coming of spring. Sitting quietly, in one place, as the sights, sounds, and smells of the new season flow past, is a joy in itself. Such a situation is ideal for journal-keeping, and it can be very interesting to reread your observations of events from year to year.

I have found that each year a number of very reliable signs precede the coming of spring. I think the dependability alone of these events is a comfort in this uncertain world.

Around the middle of February, I start looking and listening for the first wave of red-winged blackbirds (Agelaius phoeniceus) returning to Connecticut. Resident adult males return around this time and can be noticed by their persistent call, "conch-a-ree," and bright red epaulets. The red-wings usually join forces with the starlings that have been present all winter. The adult males are followed in about two weeks by migrating females and immature males; it is another two weeks before the resident adult females arrive.

Although the red-winged blackbirds' preferred habitats are marshes and swamps, the birds have become quite ubiquitous and are present in many upland habitats as well. A spring visit to a cattail marsh will almost certainly provide an opportunity to see and hear the red-wing. After courtship and display, pairing is established and the business of raising a family is begun. Beginning in May, each pair usually rears from two to three broods a season and will build a fresh nest for each clutch.

Red-wings are gregarious birds, and at the close of the breeding



Leonard Lee Rue III Photos

The phoebe appears with great regularity each year around the first day of spring.

season, gather in huge flocks with other blackbirds. Sometimes these flocks become so large that they constitute a health hazard, and steps are taken to eradicate them.

Another sign of spring that I await with eagerness is the arrival of the eastern phoebe (Sayornis phoebe). The phoebe appears with great regularity each year on or about the first day of spring. It is a rather plain bird, olive-brown above with yellowish underparts. The male's breast can often be quite yellow. The phoebe's call is a buzzy version of its name. The bird often perches on a wire and wags its tail, a behavior that provides a good clue to its identity.

I have great admiration for the phoebe. Although it is probably a mistake to assign human emotions and attributes to animals, it is hard not to think of the phoebe as being steadfast and loyal.

A member of the flycatcher family (Tyrannidae), the phoebe prefers a diet of insects. This can be a hardship in late March, and it is fortunate that the phoebe will also feed on berries. There have been a few late winter storms in recent years which I have thought would prove fatal to the phoebes. I pictured them huddled in a protected place, hungry for insect food which was likely to remain unavailable until the storm passed and warmth returned. During the first few weeks following arrival, the phoebe is chiefly occupied with the task of finding food. As the weather improves and the breeding season approaches, the male is heard calling "fee-bee" over and over and potential nest sites are explored. As a species, the phoebe is extremely adaptable in selecting a nest site. It prefers to locate near water and often nests under bridges. Other locations known to have been chosen by the phoebe include rock ledges, cliffs, the eaves of houses, wells and caves. One pair is reported to have nested in the dank darkness of an abandoned iron mine shaft. For the past several years, the phoebes in our yard have nested on a ledge under the eave of the barn. Each year, they have knocked down the old nest and constructed a new nest of mud and grass, lined with feathers and moss. Phoebes are quite tame, and despite the activity around them, stick to the task of incubating eggs and rearing the young. Trivia buffs might be interested in the fact that the phoebe may have been the first bird ever banded. In 1840, Audubon placed a silver wire on the leg of a phoebe and was able to record its return the following year.

As already noted, the phoebe feeds primarily on insects. This means that there has to be a number of insects available. Probably many of these are small and not readily noticeable. But there is one member of the insect family that makes its appearance very early in the spring and is quite noticeable. It is the mourning-cloak butterfly (Nymphalis antiopa). Several years ago, while walking through the woods on a late March afternoon after a wet snowfall, I noticed a butterfly flitting among the trees. At first I thought that my eyes were playing tricks, dazzled by the sunshine and bright snow. It seemed so preposterous to see a butterfly, a creature of lazy summer days, abroad in the bare-leaved forest. But there it was, a rich-brown butterfly, its wings edged with yellow. I later learned that mourning-cloaks actually hibernate as adult butterflies. They wake on

the warmish days of early spring and can be seen in the woods. In medieval art, butterflies were used as a symbol of the resurrection, probably because of their metamorphosis from caterpillar larva to adult butterfly. When one encounters a butterfly during the late days of winter, it is not difficult to understand such symbolism.

Along with the arrival of spring comes the nightly chorus from another group of animals, the amphibians. First to be heard are the tiny spring peepers (Hyla crucifer). In fact, one is far more likely to hear than to see the peepers. Commonly found in second-growth woodlots near vernal ponds, these small tree-frogs have loud, persistent voices and will chorus nightly during the first warm spring rains. Within a few weeks, a deeper voice may be noticed. This probably belongs to the wood frog (Rana sylvestris). Wood frogs are heard during the day as well as evening, and their sound resembles the quacking of a duck.

Both spring peepers and wood frogs breed early, laying several thousand eggs. In fact, some tadpoles may actually be swimming by the time the larger frogs are emerging from hibernation.

The early signs of spring are not restricted to the animal world alone. Plants go about their own awakening. Buckets hanging from sugar maples are a sure indication that winter is beginning to let go. Cold nights and warm days which can be typical in March are ideal for sap runs. With a lot of labor and a good supply of fuel (wood), sap can be converted to sweet-tasting syrup and sugar. It takes approximately 40 gallons of sap to make one gallon of maple syrup.

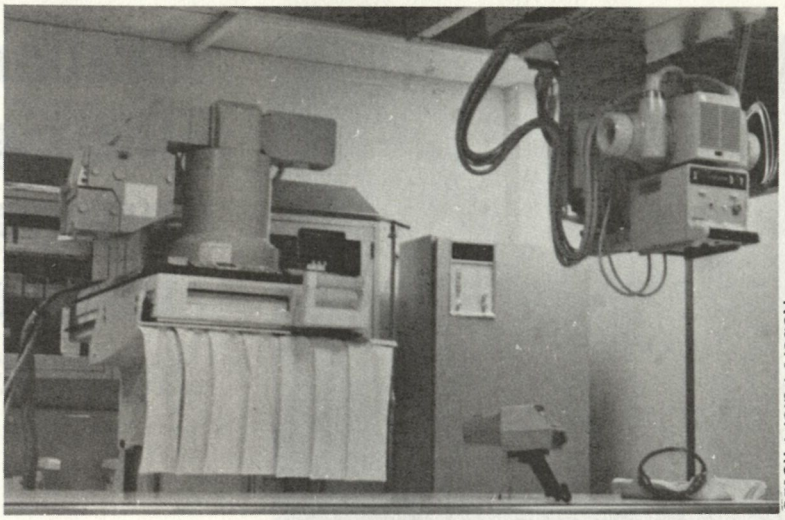
One of the more subtle signs of spring is the pale-reddish hue that tinges stands of red maples prior to bud-break. As you look at the landscape in late March or early April, delicate colors can be discerned -- pink where the maples grow, yellow-green where willows are found, reddish-brown where oaks dominate. Once you are aware of this, you may begin to appreciate spring color in much the same way as that of the fall.

Red-winged blackbirds gather in huge flocks with other blackbirds.

Be it the first pussy willow, first robin or first crocus, we all notice something each year which heralds the arrival of spring. Once the season is well under way, events are too numerous to be tallied. The very first signs, therefore, are the most rewarding to note. I'll be watching again, this year, for the red-winged blackbird, the steadfast phoebe, and the tiny spring peeper, as the seasons change.

X-rays:

the risks and the benefits



Robert Paier Photos

By Catey Sullivan, Environmental Intern

"Radiation is not a modern creation of man's curiosity in tinkering with the atom. Radiation has permeated the universe since time began." So states the Food and Drug Administration's Primer on Radiation. There are radioactive elements in the soil which directly enter peanuts, brazil nuts, some cereal grains and which indirectly infiltrate many organ meats. Some drinking water contains radioactive radon, and milk has been said to contain small amounts of Strontium-90. There are radiation belts surrounding the earth, and the sun will occasionally emit bursts of what has been termed "sub-atomic grapeshot." Varieties of shale, brick, and granite expel minute amounts of low-level radiation, while fossil fuels such as peat and coal contain traces of Uranium. There are measurable amounts of Polonium-210 and Lead-210 in cigarettes, certain types of smoke detectors contain Americium-241, some clock faces glow with Radium, certain brands of digital watches contain Tritium, and many denture sets have Uranium embedded in their pigments.

In short, radioactive elements can be found in a number of places. They have been detected high in the atmosphere and within many commonly-used consumer products. Despite the many areas in which radiation has been found, over 90 percent of the man-made radiation annually absorbed by North Americans is emitted by a source not mentioned above. The FDA's Consumer magazine states that "some x-ray examinations are unnecessary and can be avoided." By educating oneself as to the risks and benefits involved with x-ray examinations, one can responsibly weigh the value of such examinations. Maura Wilson, a radiation specialist with the Department of Environmental Protection's Radiation Control Unit, states, "Patients have the right to say yes or no to an x-ray." However, before individuals can make this decision intelligently, they should be aware of the risks and benefits associated with the particular examination or treatment.

Individuals should accept the responsibility to make their own decisions about x-rays. When possible, the patient should be told why the x-ray treatment is being prescribed and the expected results of the treatment or examination. In an emergency situation, this may not be possible. The Radiation Control Unit has the responsibility of conducting periodic inspections of Connecticut's more than 5,000 pieces of x-ray equipment.

Radiation control specialists Maura Wilson and Matthew Lennon inspect this equipment according to the ALARA principle. This principle stresses that dosage levels must be kept As Low As Reasonably Achievable. According to Dr. Martin D. Ecker, author of Radiation, ALARA is a concept which is "a touchstone for anyone concerned with radiation anywhere." He further states that ALARA is a principle which ". . . in discussions about government involvement with radiation and the setting of safety standards . . . seems to enjoy universal acceptance." The ALARA principle is practically applied every time Wilson and Lennon engage in field inspections of x-ray equipment. When monitoring the equipment in question and interviewing the operators of the equipment, Lennon and Wilson consistently question whether or not exposure levels are being kept As Low As Reasonably Achievable.

The inspection procedure of the RCU is a thorough procedure. The specialists first activate the equipment being inspected and measure the dosage of radiation

Radiation Specialist
Maura Wilson

"Patients have the right to say yes or no to an x-ray."

being emitted with a device known as the MDH monitor. The x-ray unit which I saw tested was located in the Radiology Department of Hartford's St. Francis Hospital. Wilson placed a Rare Earth Quanta-III cassette containing Light-Tight film into a slot on the underside of the examination table. Wilson demonstrated the technique involved in operating the hospital's photo-timed unit. A photo-timed unit is one which automatically regulates the amount of exposure according to the length and bulk of the patient. Wilson was then able to manipulate the field of the x-ray beam so that it would "cone in" on a specific area. Wilson explained that years ago, the beam of an x-ray could be bigger than the film itself, thus ensuring that the patient would receive an unnecessarily high dosage. Wilson then implemented the MDH monitor to measure the radiation output in roentgens. Roentgens are the units by which radiation exposure in air is measured. At St. Francis Hospital, this level was acceptable.

Besides checking the exposure levels, Wilson and Lennon measure the amount of "scatter radiation" which a particular piece of equipment emits. This is radiation which is scattered about the examination room when an x-ray is taken. The room which Wilson and I were in was built according to scatter safety regulations, as are all examination rooms. The person operates the equipment from behind a lead-lined window. Behind this window, the exposure levels are extremely low. On the side of the room containing the examination table, a degree of scatter radiation was evidenced on the Victoreen Panoramic (this is the device used to measure scatter radiation; it is not the same as the MDH monitor used to measure dosage levels), and this level was within acceptable limits.

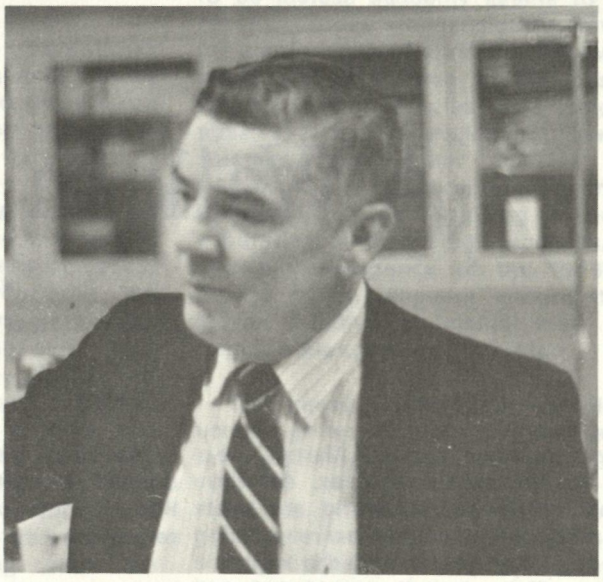
In addition to inspecting and ensuring that x-ray equipment is registered, RCU specialists conduct interviews with the persons operating the equipment. Although standard technique charts are usually used, operators can deviate from the charts depending on the size and medical condition of the patients.

Connecticut is one of several states which does not require persons operating x-ray equipment to be licensed. In this state, it is theoretically (and legally) possible for a person with no background in radiology to operate x-ray equipment. This type of hiring, as Wilson pointed out, is virtually non-existent. Although persons who operate x-ray equipment need not be licensed, training is required in order to operate x-ray machinery. This training can vary from on-the-job instruction by a licensed physician or technician to formal classroom training by a licensed institution.

After Wilson had completed her inspection, we viewed other areas within St. Francis' radiology department. I was able to watch a sophisticated x-ray image of the human brain. This image could be altered by adjusting a console attached to the screen. We were able to see this brain in cross-slices from the crown of the skull down to the center of the temporal lobes. The console could be further manipulated to produce a picture of a stomach and its surrounding components.

High standards in hospitals, dental offices, and other facilities which operate x-ray devices are important. Cumulative doses of low-level, ionizing radiation can conceivably cause adverse effects on a cellular level. However, because the dosages emitted by x-ray equipment are affected by many variables, the exact effects are difficult to determine. Dr. Ecker states that

High standards in facilities which operate x-ray devices are important.



Radiation Specialist
Matthew Lennon

". . . it is difficult to establish a firm cause and effect relationship. To a physician, the burns an individual receives from high levels of radiation appear no different than burns . . . produced by an open flame." He continues by stating that "because of the difficulty in pinpointing an exact cause, scientists and physicians are unable to state with certainty that radiation is the culprit in a particular form of cancer." It is these uncertainties which make the ALARA concept so important. Dosages must be kept low -- the lower the dosage, the less risk to the patient.

The inspection of over 5,000 pieces of x-ray equipment is a time consuming task. Currently, Wilson and Lennon are the only two persons responsible for inspecting these units. Therefore, a prioritizing program for dosage reduction in dental facilities has been put into effect in Connecticut. This program is known as DENT, or the Dental Exposure Normalization Technique. DENT has been designed so that dental equipment may be examined through the use of a thermoluminescent dosimeter chip. This TLD chip is small enough to be attached to a postcard and is capable of measuring the amount of radiation emitted by any intra-oral x-ray device used in dental exams. The dentist places the chip near the end of his x-ray apparatus and then takes an x-ray. The chip can then be mailed to the RCU and analysed. Any Connecticut dental equipment generating inappropriately high levels of radiation can be spotted immediately, and then corrected. Kevin McCarthy, Director of the RCU, stated that the response of the Connecticut Dental Association to this project "was not as positive as we had hoped." Despite the apparent reluctance of the Dental Association to endorse the program, it was decided to go forward with the quality assurance program in the hopes that it will aid the dentists in practicing better dental radiography.

Phase I of the DENT program has been completed and Phase II follow-up is now in progress. Wilson reported that the return of the TLDs has been excellent. Dentists have returned approximately 80 percent of the cards sent out.

Previous programs similar to DENT have been BENT, which was designed to analyze the exposure levels of mammography equipment, and NEXT, which looked at conventional x-ray equipment.

The value of x-ray equipment in discovering anatomical malfunctions is indisputable. However, persons making use of medical and dental x-ray techniques should learn to weigh the risks and benefits involved. While the RCU works to provide maximum medical and dental benefits with minimum exposure, individuals can also have a direct influence on the amounts of radiation they are exposed to. Patients should always inquire as to exactly why any proposed x-rays are needed and they should keep records of past x-rays so that unnecessary duplicates are not taken. Patients should not request to have x-rays taken unless they have substantial reason. Individuals should also be cautious when considering having x-rays taken by mass-screening units such as the ones used to test for tuberculosis. Pregnant women should inform their physicians before undergoing any sort of x-ray examination, and males should request a lead-lined gonad shield before having any x-rays taken in the vicinity of their reproductive organs.

While the Radiation Control Unit, with the cooperation of dentists, physicians, and qualified operators, works to insure safety in x-ray hygeine, the ultimate responsibility lies with the one person who will finally reap the benefits and take the risks: the patient himself. ■

A Walk in Early Spring

By G. Winston Carter

Illustrations by Rosemary Gutbrod

By the latter part of March, the time of the vernal equinox, certain forces in the natural world are put into motion that cannot be reversed. The days are longer and the nights shorter. There is a feeling in the air that the worst of winter is behind us. It is a day in spring, but not necessarily what we may call a spring day.

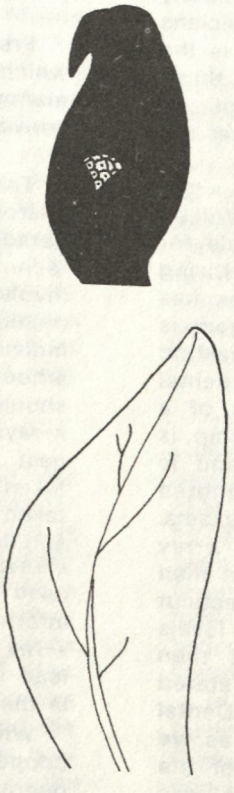
March 21st is officially the first day of spring in all parts of this country, yet we find conditions vastly different from state to state, from town to town, and even in the somewhat confined area of a woodland.

There comes a time, usually toward the end of March, when the longer days bring melting snow and the rise of sap in the trees. Along brooks and streams the water runs high or collects in little backwaters, producing a soft, continuously recycled mud, rich in organic material.

With special footwear to allow for muddy walking, I like to look for early signs of spring along a favorite stream in the woods at this time of year. The trail along the stream is less than a mile in length but passes through several habitats with different kinds of vegetation. Pushing their way through the mud along the side of the stream and the muddy depressions nearby, the tips of the skunk cabbage and false hellebore are beginning to grow skyward. Even as early as February, some years, there is evidence of early growth and blossoming in the skunk cabbage.

At first glance, skunk cabbage doesn't seem to be related to plant life. It looks like brown-greenish to red horns projecting out of the

Skunk Cabbage (Symplocarpus foetidis)



frozen ground or muck. The skunk cabbage actually runs a temperature which may be many degrees higher than its surroundings. This is from the energy generated in the plant sap, just as the body of an animal warms up with exertion. This warmth enables the skunk cabbage to push its way up through frozen muck and snow and to blossom long before other flowers. The flowering period begins in some specimens in February. Other skunk cabbage plants do not blossom until May.

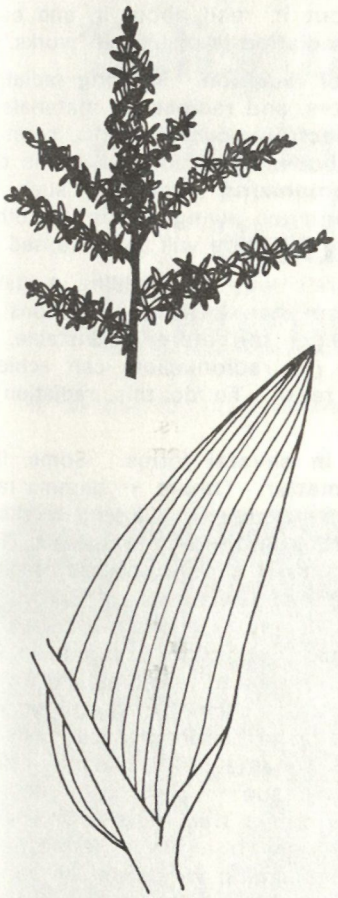
The leaves of the skunk cabbage (Symplocarpus foetidis) appear after the flowers have been pollinated. The flowers bear both stamens (male) and pistils (female) and are crowded onto a sphere-like structure (spadix) enclosed in a broad slipper-shaped hood (spathe) that is green and red and brown. Pollination is by early carrion flies which are attracted by the odor of the plant.

Skunk cabbage gets its name from the resemblance of its leaves to those of cabbage and the odor of its juice to the offensive scent produced by skunks. Two common relatives of skunk cabbage are the jack-in-the-pulpit and arrow arum. These plants appear a bit later in the year.

False hellebore (Veratrum viride) often grows with skunk cabbage. It begins to develop in early March or April. The young spear-like shoots start showing through the melting snow in early spring. The appearance of the plant when it has unfolded its showy plaited leaves is very different from that of the earlier state of growth. It will eventually have large, heavily-ribbed leaves and may reach a height of eight feet. The star-shaped flowers mature any time from May to July and appear in large clusters. At first they appear

w in color and then turn to a green, thus "viride," the Latin word for green. Veratrum is a Greek

False Hellebore (Veratrum viride)



word meaning "truly black." This refers to the roots of the false hellebore.

The leaves of the skunk cabbage and false hellebore are sometimes confused, but they do not look much alike. The greatest similarity between the two plants is the appearance of their shoots when they first occur in the spring, and the fact that they often grow side by side in the same habitat. The skunk cabbage leaves, shoots, and root stalks all may be cooked and eaten, but more as an emergency food than delicacy, and one should know how to prepare them. False hellebore, on the other hand, is poisonous. In spite of this, scientists have been able to alter the chemical nature of this plant to produce a drug that is used in the treatment of high blood pressure.

False hellebore is sometimes called Indian poke. It should not be confused with pokeweed (Phytalacea american). This is also poisonous during certain stages of its growth.

As we walk into the woods, we look for further evidence that spring is on its way. Little dabs of yellow sprinkled profusely throughout the moist woodland and along both sides of the stream catch the eye. Few plants give more of a feeling of spring than the spicebush in bloom. During the long winter months, the buds, with embrionic leaf and blossom within, wait patiently. They were formed long before cold weather had set in and wait for that moment in early spring when the buds are triggered to open.

The yellow flowers of the spicebush develop before the leaves, often as early as March, but this sometimes extends into April. The tiny blossoms are unisexual. This means that the sexes appear on separate plants and lack petals. A hand lens will reveal that the blossom has six yellow sepals. The fruit ripens between August and September and is usually red, and sometimes yellow. The flowers, leaves, fruit, and even the twigs, are fragrant when scratched.

A tea can be made from the twigs and leaves, and a mixture made from its dried and powdered berries was once used as a substitute for allspice seasoning. Numerous songbirds and game animals eat the twigs and fruit, while the spicebush swallowtail butterfly uses this shrub as a host plant.

The trail along the stream twists and turns until it comes to a clearing. Last season's grass and summer flowers have changed color and appearance. Protruding from the snow that remains are stalks of grass now tan, broken, and bent. The flowers of the past year are but a memory. The only evidence that they once brightened this area are the dried brown remains of seed pods long since emptied of their contents. Nearby, the stream bank is thick with alders and willows and there is a stirring of life as the catkins begin to emerge.

In the natural world what appears to be lifeless suddenly seems to be reborn. Those who anxiously watch for subtle signs of spring in the plant world will find them in the pussy willow. This species has larger pussies, or undeveloped flower clusters, than other species of willow. Even in February there may be plants that are beginning to show a bursting of their single-scale buds and the emergence of the fur-like pussy, which appears before the leaves. Individual plants may be found in blossom well into May.

The pussy willow (Salix discolor) usually grows as a shrub. Male and female flower clusters are borne on separate plants. The male, or staminate, flowers are laden with golden pollen when mature. This is sought by bees to feed their young. The female, or pistillate, flowers are softer, silkier, longer, and are less colorful.

Each staminate and pistillate catkin consists of many tiny flowers or florets. Attached to every floret is a nectar-producing, hairy scale, or bract. This is what attracts the bees.

Pollination is carried out mainly by the wind, although the work of bees may also be important here.

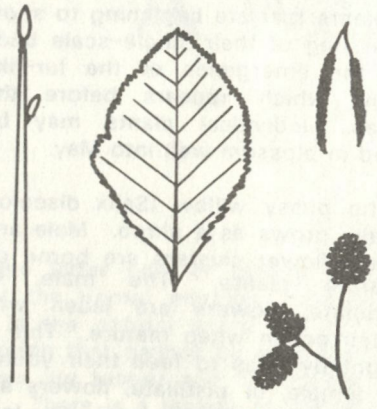
Each individual floret of the female catkin eventually becomes a fruit which is a tiny, two-valved, urn-shaped capsule that contains many minute hairy seeds. These are adapted for wind dispersal.

The buds and shoots of pussy willow are food for animals such as rabbits and squirrels, while occasionally the small branchlets are eaten by deer.

The alder (Alnus serrulata), which grows as a shrub or a small tree, often goes unnoticed during the summer months because there is little about it that is colorful. In the winter, however, the persistent cones (strobiles) become more noticeable and in early spring the male and female catkins begin to expand and flower. This occurs early in the spring before the leaves emerge. The catkins, which contain many small flowers, were formed the previous season and wait for favorable conditions before blossoming. The flowers are protected by dark, overlapping, purplish-red scales in the winter.

The staminate clusters of catkins expand several times their original length when they blossom.

Smooth Alder (Alnus serrulata)



During the flowering period, the pendant staminate catkins appear golden and purple as they shed their load of pollen. The pollen matures slowly and is carried by the wind to the females which are on the same plant. The female clusters are very small and cone-like and expand only slightly as they blossom. They are usually found directly above the male cluster of catkins. When blossoming occurs, very small reddish hairs project outward in all directions from each tiny flower.

The woody fruit that forms opens in the autumn to shed tiny seeds. These are dispersed by the wind. The cones, or strobiles, remain on the tree and do not disintegrate. Birch trees have similar cones, but they disintegrate and do not persist on the trees.

Later in the season, red-winged blackbirds and goldfinches will nest in the upper branches, chickadees and goldfinches will eat the tiny seeds of the fruit, while grouse will feed on the reddish, stalked buds. Rabbits and deer occasionally browse on the twigs.

March doesn't have many signs of spring, but the signs it does have are special. All the early signs of emerging life that we have seen create the stage that fuels our anticipation of a much more active explosion of new green leaves and blossoming to come. ■

The ABC & X of Radiation

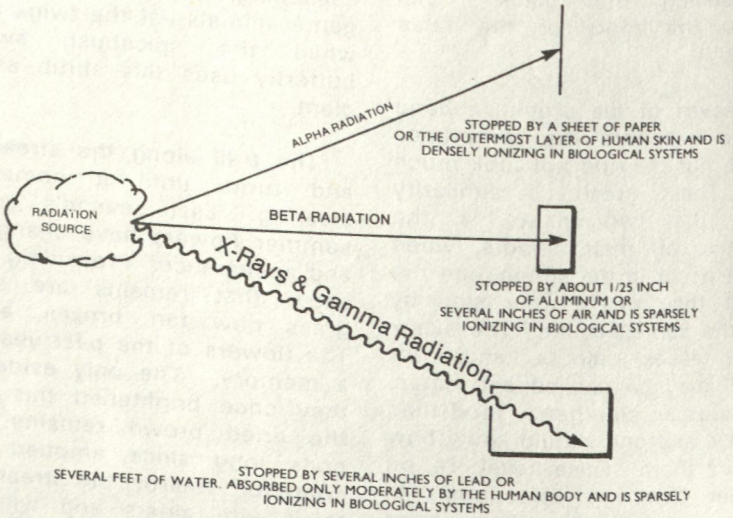
By Bill Rados
Reprinted from FDA Consumer

With the advent of atomic weapons, nuclear powerplants, x-ray machines, and other such technological marvels, "radiation" has become a household word. But though we talk about it, read about it, and even worry about it, few of us understand what radiation is or how it "works."

First of all, there are two main types of radiation. **Ionizing** radiation comes from x-ray machines, nuclear reactors, and radioactive materials. It gets its name from its ability to knock electrons out of atoms, creating electrically charged **ions**. In the human body, these ionized atoms can affect normal biological functions. **Nonionizing** radiation, such as microwaves, sound waves, and light, damages living tissue by other means. For our purposes here, only ionizing radiation will be discussed.

Radioactivity may be said to be nature's way of "building a stable relationship." When a nucleus of an atom has a ratio of protons to neutrons that is outside an optimum range, the atom is unstable, or radioactive. Such a radioactive element (or radionuclide) can achieve stability by changing the proton-neutron ratio. To do this, radiation is released from the nucleus.

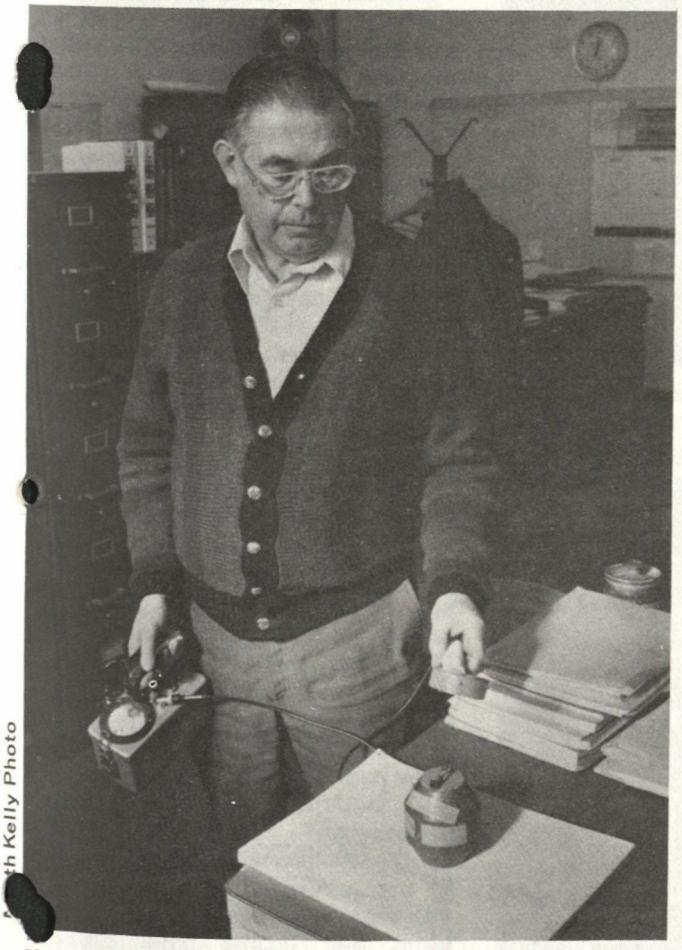
Radioactive substances emit radiation in several forms. Some, like alpha and beta radiation, are particles of matter. Others -- gamma rays and x-rays -- are pure energy, possessing no mass. (Gamma rays and x-rays are identical in their physical properties and biological effects. The only difference is that gamma rays are natural products of radioactiv atoms while x-rays are produced in man-made machines.) Particulat radiation does not penetrate body tissue as deeply as gamma or x-rays. It mainly damages the skin and surface organs, although it can harm the surfaces of internal organs if it is inhaled or ingested. Gamma and x-rays penetrate more deeply into the body and can do their damage throughout any internal organs that are exposed. Ionizing radiation gradually uses up its energy as it collides with the atoms of the material through which it travels. The material -- for example, living tissue -- absorbs the energy, mainly through the ionization of its atoms. It is this transfer of energy that can cause tissue damage and adverse health effects. The damage can be done by external radiation, such as gamma rays from an atomic bomb explosion, or internally, for example, from drinking milk contaminated with radioactive iodine that is giving off beta particles. ■



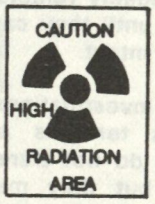
The penetrating and ionizing power of various radiations.

Radiation Safeguards in Industry and Commerce

By Martha Kelly, Environmental Intern

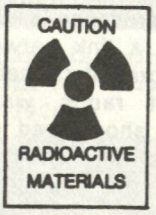


Physicist Donald Karn demonstrates the use of the Geiger counter in checking for radioactivity.



What do smoke detectors, exit signs, and steel mills have in common? Each may make use of a radioactive material in its operation. The industrial and commercial uses of radioactive substances are growing, according to Donald Karn, a physicist with the DEP's Radiation Control Unit. Increased use of these materials keeps Karn busy travelling the state, assuring that users comply with state safety standards.

Sensing devices which employ radioactive materials are becoming common, for they allow non-destructive inspection of solid materials. Such devices may be used to ensure that each of the paint cans leaving a production line is full or to test the integrity of the welds in a bridge or other sturcture. Gauges which use radioactive sources to measure with great precision the thickness of materials have earned themselves a place in steel mills and in the production of computer components.



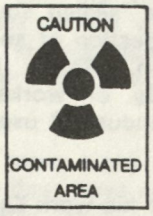
Even though the radioactive material is, in each case, enclosed in a "sealed source," state regulations call for regular inspection of such sources for leakage and safe operation. These inspections, aimed at assuring the safety of workers and all neighbors surrounding these industrial users, are a major part of Karn's duties.

In the process of his work Karn does a good deal of public education, demonstrating the proper use of radiation detection instruments to plant personnel. State regulations require users of radioactive materials to make periodic surveys of the area around a radioactive source and to keep records of the results.

When an emergency arises involving radioactive materials, Donald Karn is the man called in to investigate. Fortunately, most such emergencies do not involve a release of radioactive material, but are precautionary. A rather typical sort of emergency might involve a transporter of radioactive medical products. If a truck carrying radioactive materials becomes involved in a motor vehicle accident, many people are understandably reluctant to get involved in moving the vehicles until they can be assured that the radioactive source is intact.

Other of Karn's investigations involve radioactive contamination. This term is a misleading one as radioactive materials do not transfer their radioactivity to other materials, but they may become physically mixed with or chemically bonded with other elements. All radioactive materials share the property of instability. They are in a constant process of decay, by which process they are transformed into other substances. Each radioactive element has a characteristic decay scheme. Isotopes that are caused by the radioactive decay of some other isotope are known as "daughter products." In the case of Radium-226, for example, there are 10 successive daughter products ending in the stable isotope Lead-206. Each radioactive element has a specific halflife, the time in which half the atoms disintegrate to another form. Halflives vary from millionths of a second to billions of years. The potential for biological damage from a radioactive material depends on its decay scheme and halflife. Knowledge of this breakdown process aids the investigator as to the source of radioactive contamination.

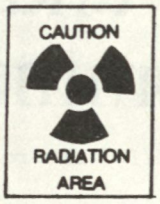
A well-publicized episode of such radioactive contamination involved gold jewelry; its investigation began in the 1960s and has continued in this decade. A large-scale public health survey carried out in New York State in 1981 revealed many radioactively contaminated gold items, mostly class rings dating from the 1930s and 1940s from several Buffalo-area high schools. The presence of Lead-210, a radioactive element, suggested a link between the contaminated gold and an early form of cancer therapy, in which the radioactive element radon was implanted in gold "seeds." Radon, a short lived material, decays, after several generations of "daughters," into Lead-210. Authorities conjectured that the gold from spent "seeds" had somehow found its way back into the commercial gold supply.



Early in 1984, a similar program of screening was carried out after a sharp-eyed dermatologist recognized a patient's skin rash to be a radiation-related disorder. Karn investigated and found that recent repair work done on a ring she w involved the use of radioactive contaminated gold.

When efforts to locate the original source of the contamination failed, Karn surveyed gold brokers in the state and examined their gold stocks. They gave him full cooperation, but no more radioactively contaminated gold was found. Nevertheless, most dealers purchased a Geiger counter for the purpose of making regular surveys of their gold stocks.

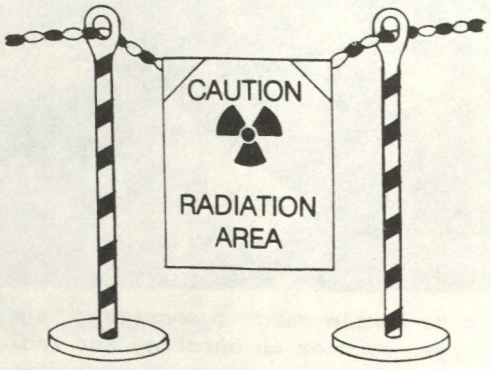
Late in 1984, another contamination report set off a three-week-long investigation. Cast iron produced at two Mexican foundries had been discovered to contain radioactive contamination from a medical device containing Cobalt-60. This precipitated an intense but



tedious search for the products which had already been made and imported into the U.S. before disco of the contamination. In this part of the country, cast iron was traced to cast table legs intended for restaurants. The radioactive material had been unevenly distributed through the cast iron, so nothing less than a piece by piece examination would do. In the three weeks of the investigation, 600 table legs were examined; none of them was found to contain radioactively contaminated cast iron.

The Mexican spill was the result of human error. Such episodes are rare, but they underscore the importance of the safeguards which the Radiation Control Unit administers.

The Radiation Control Unit will perform surv s where radioactive contamination is suspected by the public. ■

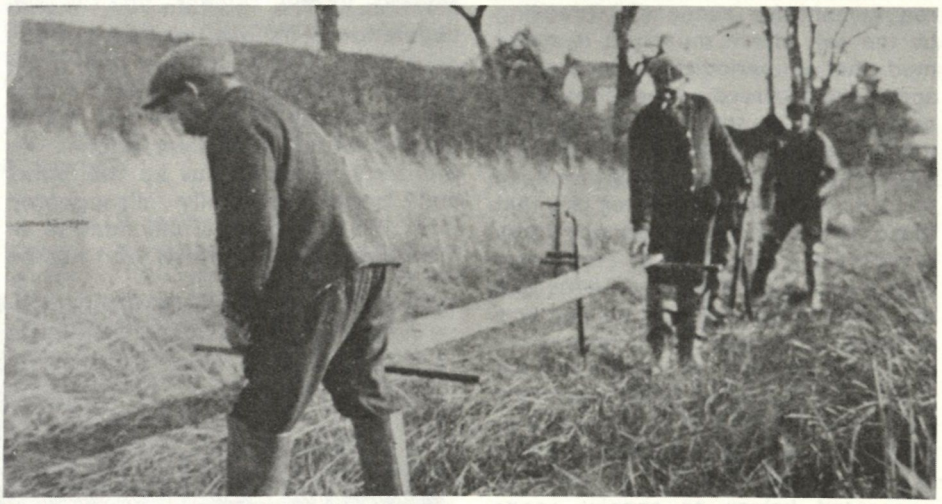


Mosquito Control in Connecticut Salt Marshes

By Diane Giampa, Citizens' Participation Coordinator
and
Ron Rozsa, Senior Environmental Analyst

Everyone is familiar with the mosquito, a member of the insect order Diptera which also includes other flying insects such as the housefly and the black fly. While the diet of the male mosquito consists primarily of nectar drawn from flowers, the female of the species will bite birds, rodents, and -- as we know only too well -- humans for a nourishing meal of blood that is necessary for the maturation of the eggs. Here is where our story begins. This unwelcome habit of the female mosquito of pestering people while they picnic, fish, or sleep, led historically to attempts to control the mosquito on salt marshes.

There are many species of mosquitoes and most breed in freshwater. However, one species in particular breeds entirely on the salt marsh. This mosquito is aptly termed the salt marsh mosquito and its scientific name is Aedes sollicitans. Readily identified in the field by its "racing stripes," white bands on its legs and proboscis, the salt marsh mosquito is renowned as a strong flier and a persistent biting mosquito. Historically, populations of this mosquito on the salt marsh were controlled primarily through the construction of ditches. The purpose of digging the ditches was to remove pools of water from the surface of the marsh. To understand how the mosquito ditch works, one must understand the breeding biology of this mosquito and the ecology of salt marshes.



In this marsh in Westbrook, a guide board is being placed in position for cutting the mosquito ditch with hay knives. (Photo: Connecticut Experiment Station Bulletin, 1926)

Removing the sod with spades and placing it alongside the ditch. (Photo: Connecticut Experiment Station Bulletin, 1928)

The female lays her eggs on moist mud, usually on that portion of salt marsh called high marsh. This is the more elevated zone of the marsh which is flooded twice a month by spring tides. ("Spring" tides are the highest tides of the month; they occur during the new moon and the full moon.) The eggs must incubate or ripen for a few days on the mud before being flooded with salt water. When the spring tides flood the high marsh, the eggs hatch. The young, or mosquito larvae, are aquatic and must periodically swim to the surface for a breath of air. If the water remains in the pools long enough, then the larvae will change into the pupal stage much like a butterfly. After the pupal form, the larvae are transformed into adult mosquitoes.

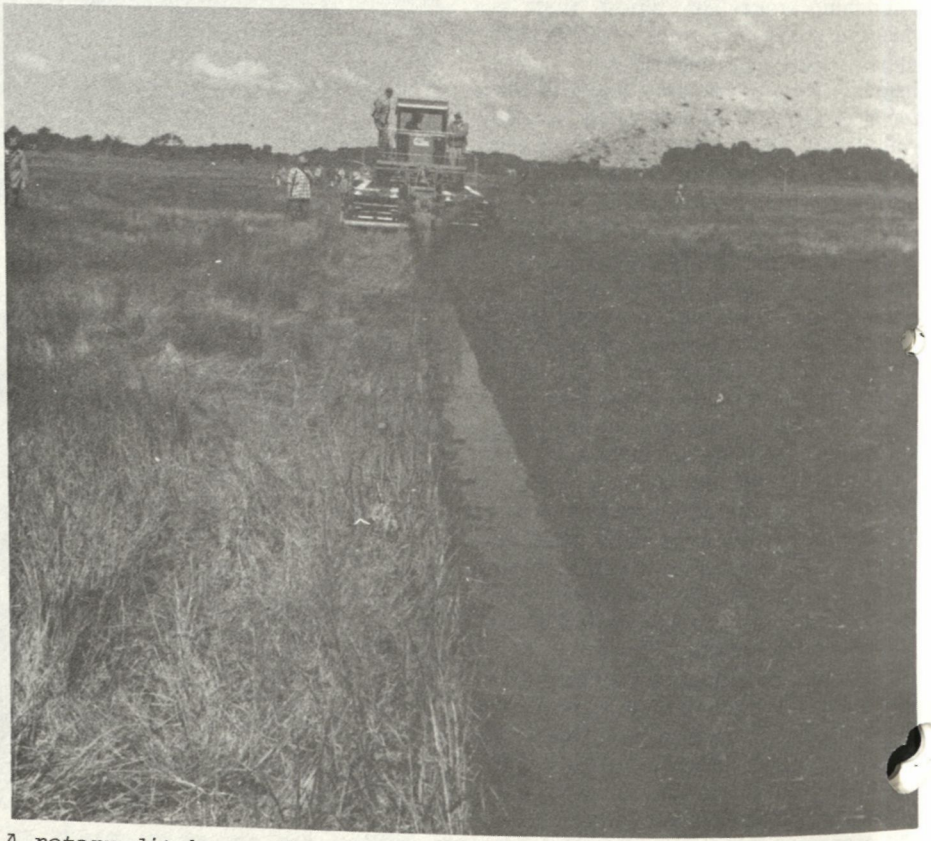
Since the basic habitat requirement for successful breeding by the salt marsh mosquito is moist mud that is periodically flooded by spring tides, breeding on permanent open water is not possible for this mosquito. Construction of a mosquito ditch will generally remove the adjacent surface water so that these temporary pools do not form. Most of Connecticut's salt marshes were ditched between the 1910s and the mid-1930s. The ditching was originally done with hand tools using a grid pattern of perpendicular ditches. The ditch lines were laid out with twine and a board was placed on the marsh surface to serve as a cutting guide. A pair of connected knives or special spade was pushed into the organic soil or peat and a slab of peat was removed and placed alongside the ditch. But very often these slabs of peat formed a continuous mound of material which functioned as a levee, causing the water to form pools on the marsh, which may have even exacerbated the mosquito breeding problem.

In Connecticut, there are roughly 750 miles of mosquito ditches maintained by the Mosquito Control Section of the Department of Health Services. Digging and maintaining the ditches was a time-consuming task, and in 1979 the Mosquito Control Unit purchased an amphibious vehicle called a rotary ditcher, that could drastically reduce the time needed to clean and maintain the ditches. The amphibious machine tows the ditcher which is then lowered into the marsh. When activated, the machine removes debris and sediment from the ditch and broadcasts this material across a wide area of marsh -- much like a snowblower throws snow. The thin layer of material fertilizes the marsh grasses, and the sediment is removed by the spring or storm tides. The use of the rotary ditcher on existing ditches did reduce the amount of surface water on the marsh and, consequently, it reduced the numbers of mosquitoes produced on the marsh.

However, ditching (by hand or by machine) as a method of mosquito control has always had both positive and negative environmental results. The removal of surface water from a marsh changes the hydrology of the surface soils and improves soil aeration. The pattern of marsh vegetation changes or repositions itself and certain grasses can grow better. Colonial farmers who harvested salt hay from the marsh also constructed shallow ditches for this very reason. But as the pools and ponds generally disappeared from the marshscape, the number of shorebirds and waterfowl who nested in these habitats declined also. Sportsmen and wildlife biologists watched the productivity of these species decline as the marshes were ditched in the first half of this century.

The Mosquito Control Section of the Department of Health Services has been working with DEP staff and is now proposing to modify its mosquito control management techniques on salt marshes. There will be a shift from the use of grid ditching to a new management practice called Open Marsh Water Management (OMWM) that is more sensitive to Connecticut's marsh ecology.

Essentially, the strategy of OMWM will be to focus attention on specific mosquito breeding areas within each marsh, rather than to treat an entire marsh system in a uniform manner. The goal is to prevent the formation of the "intermittent" or "temporary" pools where the mosquito breeds. This will be done by managing the water levels, the flow, and the frequency of tidal flushing so that the need to alter physically the character of our coastal marshes is reduced. ■



A rotary ditcher works very much like a snowblower. (Photo: Ron Rozsa)

Pheasant Tag Details

Paul Herig, Director of the Wildlife Bureau, Department of Environmental Protection, announced that sportsmen will be able to purchase the $5.00 series of 1985 pheasant harvest tags at all town clerks' offices this coming year.

Pheasant tags and application forms will be distributed to all town clerks' offices and sales will begin on March 1, 1985. Tags will no longer be sold at the DEP Hartford or district offices and mail applications will not be accepted. Pheasant hunters are urged to obtain their tags early and avoid the last minute rush prior to the October 19th season opener.

The new tag system includes a peel-off stamp portion which, after being signed by the applicant, will be affixed to the back of the hunter's small game license by the issuing agent. This procedure validates the accompanying series of 10 tags which corresponds to the seasonal bag limit on pheasants. Pheasant hunters should note that due to the validation procedure, they should not permanently seal their small game license in plastic. As in the past, sportsmen should also be reminded that holders of junior hunting licenses are not eligible to purchase pheasant tags. Juniors may hunt pheasants only when accompanied by a licensed individual over 18 years of age and they must share their daily bag limit and pheasant tags. In addition, there are no provisions for free tags for persons over age 65 holding lifetime licenses.

Pheasant hunters were first required to tag harvested birds during the 1983 season. The tagging system was implemented to generate revenue to cover the rising costs of game birds, to provide a method to enforce the seasonal bag limit, and to give more sportsmen a chance to utilize the benefits of pheasant stocking.

Tags were originally sold at one location only and many hunters experienced delays in obtaining tags after the central office became overloaded with last minute requests. The revised system and expanded distribution of sales is expected to greatly increase tag availability to sportsmen while maintaining the integrity of the program. ■

Caring for Your Firearms

For proper care, firearms require a thorough cleaning at the close of the hunting season before putting them into long-term storage, according to Frank Disbrow, Conservation Education/Firearms Safety Coordinator for the Department of Environmental Protection.

"First, it is important to give your firearm a good wash," Disbrow advises. "Be sure it is unloaded. Lock up all ammunition. Next, refer to your manufacturer's manual and strip the firearm. Clean all metal parts with a good solvent to take care of any leading (metal fouling) and unburned powder buildup. A stiff brush, such as a toothbrush, will be effective for scrubbing extra-dirty areas. Make sure all exposed surfaces are wiped clean of moisture and grit, two of the most hazardous elements to any firearm."

After using solvents, store them out of the reach of children. (If accidentally taken internally, call a physician immediately.)

Once all the metal parts are clean, lubricate the barrel and all moving parts, then reassemble the firearm. Use a commercial gun oil, one that is light and clean and has a high viscosity. Penetrating oils are not recommended because they may gum-up the action and soften the wooden parts.

After the gun is lubricated, store it in a locked cabinet. A horizontal position is effective for preventing excessive oil leakage into the action, but the best way to store a firearm is with the muzzle down and in a secure rest.

Those who do not know how to strip a firearm, or are unsure of proper cleaning, should take it to a qualified person. If your firearm is not functioning with the surety and speed it had when it was new, take it to a professional gunsmith and have broken or worn parts repaired or replaced.

"The Connecticut Conservation Education/Firearms Safety basic firearms course is the place to learn about firearms, safe gun handling, and hunter responsibility," reminds Disbrow. "When properly cared for, your firearm should last season after season and allow for safe, enjoyable hunting."

For information contact the regional office in your area: Franklin Wildlife Management Area, Route 32, North Franklin, Connecticut 06254 (East) 642-7239, or Sessions Woods Wildlife Management Area, P.O. Box 1238, Burlington, Connecticut 06013 (West) 584-9830, between the hours of 8:30 a.m. and 4:00 p.m. ■

Wildlife Week

With spring comes the renewal of life -- crops are planted, flowers bloom, and animals are born. It is a season of awakening and growth. What better time for a celebration of one of our nation's most important natural resources -- the soil.

"SOIL -- we can't grow without it" is the theme for National Wildlife Week, 1985, sponsored by the National Wildlife Federation and its state affiliates. Millions will participate in the annual observance of Wildlife Week during the first week of spring, March 17th to 23rd, bringing a new awareness of our soil resources to classrooms, nature centers, and homes across the country.

Wildlife Week began in 1938 by proclamation of President Franklin D.

Roosevelt. Since that time, the National Wildlife Federation has used the occasion as an opportunity to educate the public about important natural resource concerns. This year's theme is especially appropriate because it coincides with the fiftieth anniversary of the founding of the USDA Soil Conservation Service (SCS) by President Roosevelt.

The SCS and other organizations are still working to combat the eroding effects of wind and water on our nation's farmland. Stripcropping, contour farming, conservation tillage, windbreaks, and protective cover vegetation are some of the conservation practices they promote. These practices also benefit wildlife. Cover crops, hedgerows, and crop residues left on the field provide animals with food and shelter. Soil conservation can enhance natural habitat and create new places for wildlife. In this way, land can be managed for the benefit of both people and wildlife.

Conservation Officer Thomas Ziobo is honored as the 1984 recipient of the Shikar-Safari Club International Wildlife Officer of the Year Award. Officer Ziobo, selected by his peers to receive this award, was presented with a plaque and certificate in recognition of his outstanding contribution to conservation and wildlife management over the years. From left to right: Sergeant Henry Konow, Jr.; Thomas Ziobo; Deputy Commissioner Dennis DeCarli, Conservation and Preservation; Frederick Pogmore, Director, Law Enforcement Unit; and Dr. C. Joseph Cross, representing the Shikar-Safari Club.

The Night Sky

By Francis Downey
Production Designer,
Gengras Planetarium

March is usually said to "come in like a lion and leave like a lamb." Regardless of the validity of this old wives' tale, March does herald the beginning of spring. This year, spring begins on March 20, at 11:14 a.m. But, what really causes the seasons?

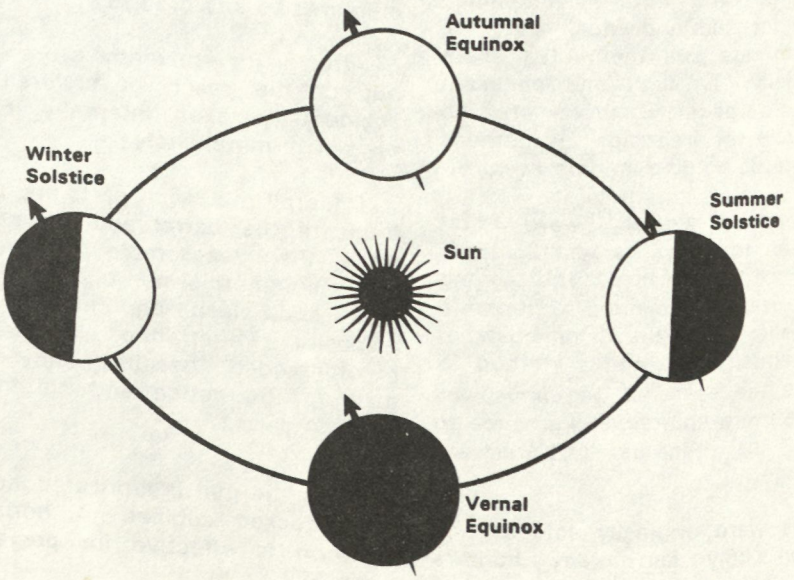
Many people think that the earth is actually closer to the sun during the summer months. This isn't quite true. Actually, here in the Northern Hemisphere, the earth is about two million miles farther away from the sun than it is during the winter months.

The seasons are actually produced by a slight tilt of the earth's axis to the plane of its orbit. A result of this tilt is that one hemisphere points toward the sun, while the other points away from the sun.

The Northern Hemisphere leans closest to the sun on the summer solstice, which usually occurs around June 21. On this date, the sun is at its highest point in the sky. When the sun is high in the sky, there are more hours of daylight because the sun has a longer path to travel in the sky.

During the winter months, the sun is very low in the sky, and the days are shorter because it doesn't take very long for the sun to travel through the sky. The sun reaches its lowest point in the sky on or near December 21. Because the sun has the shortest distance to travel in the sky, this is the shortest day of the year.

Between the winter and summer months there are two dates when the hours of daylight and night are the same. These are known as the vernal and autumnal equinoxes, which occur about March 21 and September 21, respectively. On these dates, neither the Northern nor the Southern Hemispheres is pointing toward the sun. ■



Book Review

"Articulate Naturalists" Speak Up

By Catey Sullivan, Environmental Intern

Speaking for Nature. By Paul Brooks. 1983. Sierra Club Paperback Library, 304 pp. $8.95.

When Theodore Roosevelt was president, he stated that much of this country's future "would depend on the efforts of articulate naturalists." Paul Brooks' latest work, Speaking for Nature, describes the lives of a number of "articulate naturalists." Brooks' book, obviously dedicated to the importance of "writing that seizes on the reader's imagination and reveals the truth that lies beneath the scientific fact," follows the tracks of literary naturalists from the early 19th century's Henry David Thoreau to the 20th century's Rachel Carson. In Speaking for Nature, Brooks reports on a specialized but important subject. While many readers will already be familiar with the life of Thoreau and the time he spent at Walden Pond, they will perhaps not be as well acquainted with the adventures of Clarence Dutton in the Grand Canyon. Brooks succeeds in bringing to notice the impact and writing of lesser-known naturalists and in highlighting the work and action of environmentalists already widely-known.

Brooks has arranged Speaking for Nature in chronological order. He begins with early works such as Clarence King's Mountaineering -- a vivid account of life in the Yosemite Valley -- and goes on to Rachel Carson's Silent Spring -- a description of the effects of man's wide-spread use of toxic chemicals.

Brooks parallels the writings of literary naturalists with the effects their writings have had on the United States. Speaking for Nature is filled with the history of the environmental movement. Brooks' survey clearly demonstrates the power of the printed word. Brooks explains that the creation, by act of Congress in 1903, of Yosemite National Park was a decision influenced in large part by Robert Underwood, an environmental essayist for Century magazine. The effects of Silent Spring were no less dramatic; a Congressional committee was established for the purpose of investigating the impact of such substances as DDT on the environment. Brooks' discourse on these and other nationally-felt actions concerning environmental preservation emphasizes the effectiveness of conservationists with a strong command of the English language.

In addition to providing an account of the effects naturalist/authors have had on the United States, Brooks chronicles the lives of these authors, describing details of their education, families, and even their rivalries.

Through Speaking for Nature, Brooks brings together groups of authors usually viewed only individually. He covers many writers -- both the well-known and the not-so-well-known. The ideas and accomplishments of over 70 literary naturalists are made readily accessible in Speaking for Nature. For a history of the environmental movement in the United States, and an introduction to the work of the people who were largely responsible for that movement, Speaking for Nature is highly recommended. ■

"The Connecticut Department of Environmental Protection is an equal opportunity agency that provides services, facilities and employment opportunities without regard to race, color, religion, age, sex, physical handicap, national origin, ancestry, marital status or political beliefs."

For an itchy whale, shaped like a blimp, scratching can be a problem, says National Wildlife's Ranger Rick magazine. A white whale relieves its itches by rolling and rubbing on rocks, gritty sand, and gravel. ■

Tons of hazardous pesticides, paints, cleaners, and solvents stored in basements and garages may be the country's biggest hidden pollution problem, says International Wildlife magazine. A regional government agency in Seattle estimates there are more than 100,000 pounds of the banned pesticide DDT stored in the Seattle suburbs alone. Some 25 states are setting up toxic waste collection points to help combat this problem. ■

The world's largest bee, last spotted in 1859, has been rediscovered in Indonesia by a University of Georgia student, reports International Wildlife magazine. The bee, which grows to the size of a small hummingbird, "blundered into me," says entomologist Adam Messer, who has since located seven colonies of the bees on three islands. ■

Endnote

". . . man is a newcomer on this earth. In a sense, he is still a stranger here, trying to fit himself into his environment -- or to fit his environment to him -- and learning, slowly, to live with his own kind and all the other forms of life around him. His tenure here is unpredictable. Even while he is here, his life depends on a thousand variable conditions, most of which really are beyond his control.

"This should leave little room for human arrogance."

Hal Borland
Book of Days
Alfred A. Knopf, 1976

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